Real Time Conformational Analysis of Rhodopsin Using Plasmon Waveguide Resonance (PWR) Spectroscopy in Microgravity

Problem Statement

- Currently, there is no way to obtain pharmacokinetic or pharmacodynamic data in real time in microgravity.
- With PWR, one will be able to obtain pharmacological data in microgravity.
- One immediate use of this technology is collecting data concerning vision loss in astronauts. Vision is controlled by the rhodopsin system in the eye. This is our first target in parabolic flight
- This technology, when mature, can be used to study drug interactions with receptors in microgravity, not only to generate binding curves but also to analyze conformational changes in the receptors.

Technology Development Team

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Proposed Flight Experiment

Experiment Readiness:

- Experiment will be ready for flight by the end of the second quarter 2013.

Test Vehicles:

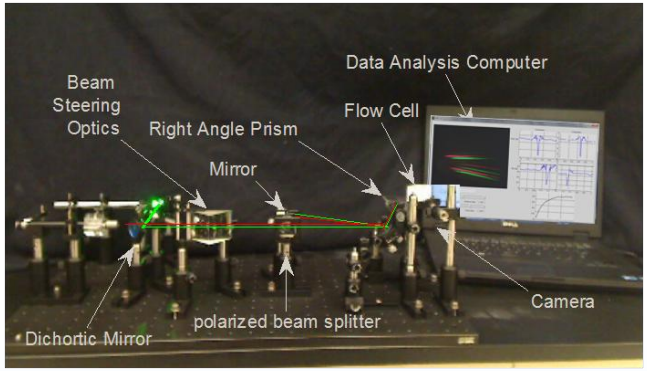
- Parabolic aircraft.

Test Environment:

- Microgravity environment required; No experiments involving PWR have yet flown in a mission.

Test Apparatus Description:

- PWR involves the interaction of polarized lasers with a lipid bilayer and observing the changes in the absorption bands. This is completely controlled by laptop interface as shown below.



Technology Maturation

- TRL6 will be obtained with integration of a new camera and laptop into the instrument, and the complete integration of the software used to capture and process data.
- The steps to mature the instrument include purchasing the final camera and laptop and integrating the software
- Deadline for the purchase of laptop and the software integration is the end of the first quarter 2013.

Objective of Proposed Experiment

- Flight data will confirm the viability of PWR as a method for performing pharmacology studies in microgravity.
- The second objective is to obtain specific data concerning whether there are changes in the conformation of a rhodopsin receptor upon exposure to microgravity. Changes in conformation may be the first in a cascade of events that results in vision loss in astronauts.

TA6 Human Health, Life Support & Habitation Systems; TA8 Science Instruments, Observatories and Sensor Systems